WE CLAIM AS OUR INVENTION:

1. A method for intraoperatively generating and updating a volume dataset, comprising the steps of:

(a) acquiring a series of n 2D x-ray projections of biological tissue, in an initial position, of a patient respectively at n different projection angles with an x-ray system, each of said projections having an associated projection geometry selected from the group consisting of known projection geometries and determinable projection geometries, said n 2D x-ray projections forming a volume dataset for said biological tissue;

(b) reconstructing image information of said volume dataset representing said biological tissue from said n 2D x-ray projections using said associated projection geometries;

(c) after a positional change of said biological tissue, intraoperatively acquiring a series of m 2D x-ray projections of said biological tissue respectively at m different projection angles with said x-ray system, wherein $m < n$, said m 2D x-ray projections forming a further volume dataset;

(d) for each of said intraoperatively acquired m 2D x-ray projections, obtaining an associated projection geometry;

(e) segmenting image information of said further volume dataset so that a 2D contour of the biological tissue is present in each of said m 2D x-ray projections; and

(f) using the respective projection geometries obtained in step (d) back-projecting said 2D contours that are segmented in the respective m 2D x-ray projections into the image information of said volume dataset reconstructed in step (d), to produce an updated volume dataset containing a 3D contour of said biological tissue after said position change.

2. A method as claimed in claim 1 wherein said updated volume dataset comprises a 3D contour of said biological tissue in said initial position and a 3D contour of said biological tissue after said positional change, respectively displayed in a visually coded manner allowing visual differentiation of the respective 3D contours.

3. A method as claimed in claim 2 comprising displaying the respective 3D contours with coding selected from the group consisting of grey scale coding and color coding.

4. A method as claimed in claim 1 wherein steps (a) and (c) comprise acquiring said series of n 2D x-ray projections and said series of m 2D x-ray projections of bone fragments, as said biological tissue.

5. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for acquiring said series of m 2D x-ray projections at respective positions that are substantially the same as respective positions of

said x-ray system for acquiring said series of n 2D x-ray projections in step (a).

6. A method as claimed in claim 5 comprising automatically bringing said x-ray system to said same positions by a motor drive of said x-ray system.

7. A method as claimed in claim 5 comprising manually bringing said x-ray system to said same positions with electronic monitoring from at least one of angle transmitters and position transmitters.

8. A method as claimed in claim 5 comprising bringing said x-ray system to said same positions using a mechanical arresting mechanism that interacts with said x-ray system.

9. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by calculation, in a calibration procedure, from said projection geometries in step (a).

10. A method as claimed in claim 1 comprising positioning said x-ray system in step (c) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (d) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by interpolation, from said projection geometries in step (a).

11. A method as claimed in claim 1 comprising employing a C-arm x-ray apparatus, having an x-ray source and a radiation receiver mounted on a C-arm, as said x-ray system in steps (a) and (c).

12. A method for intraoperatively generating and updating a volume dataset, comprising the steps of:

(a) acquiring a series of n 2D x-ray projections of biological tissue, in an initial position, of a patient respectively at n different projection angles with an x-ray system, each of said projections having an associated projection geometry selected from the group consisting of known projection geometries and determinable projection geometries, said n 2D x-ray projections forming a volume dataset for said biological tissue;

(b) reconstructing image information of said volume dataset representing said biological tissue from said n 2D x-ray projections using said associated projection geometries;

(c) segmenting image information in said volume dataset of said biological tissue to produce a 3D contour of said biological tissue in said volume dataset;

(d) after a positional change of said biological tissue, intraoperatively acquiring a series of m 2D x-ray projections of said biological tissue respectively at m different projection angles with said x-ray system, wherein m < n, said m 2D x-ray projections forming a further volume dataset;

(e) for each of said intraoperatively acquired m 2D x-ray projections, obtaining an associated projection geometry;

(f) projecting said 3D contour of said biological tissue that was segmented in step (c) in said volume dataset into each of said m 2D x-ray projections acquired in step (d);

(g) repositioning the 3D contour of the biological tissue that is segmented in aid volume dataset until said 3D contour projected into each of said end 2D x-ray projections is substantially congruent with image information of said biological tissue in the respective m 2D x-ray projections; and

(h) supplementing said volume dataset with a further 3D contour visually representing said position change of said biological tissue, to produce an updated volume dataset.

13. A method as claimed in claim 12 wherein step (g) comprises repositioning said 3D contour by an adjustment selected from the group

consisting of rotational adjustments and translational adjustments until said substantial congruity is achieved.

14. A method as claimed in claim 12 wherein said updated volume dataset comprises a 3D contour of said biological tissue in said initial position and a 3D contour of said biological tissue after said positional change, respectively displayed in a visually coded manner allowing visual differentiation of the respective 3D contours.

15. A method as claimed in claim 14 comprising displaying the respective 3D contours with coding selected from the group consisting of grey scale coding and color coding.

16. A method as claimed in claim 12 wherein steps (a) and (d) comprise acquiring said series of n 2D x-ray projections and said series of m 2D x-ray projections of bone fragments, as said biological tissue.

17. A method as claimed in claim 12 comprising positioning said x-ray system in step (d) for acquiring said series of m 2D x-ray projections at respective positions that are substantially the same as respective positions of said x-ray system for acquiring said series of n 2D x-ray projections in step (a).

18. A method as claimed in claim 17 comprising automatically bringing said x-ray system to said same positions by a motor drive of said x-ray system.

19. A method as claimed in claim 17 comprising manually bringing said x-ray system to said same positions with electronic monitoring from at least one of angle transmitters and position transmitters.

20. A method as claimed in claim 17 comprising bringing said x-ray system to said same positions using a mechanical arresting mechanism that interacts with said x-ray system.

21. A method as claimed in claim 12 comprising positioning said x-ray system in step (d) for obtaining said m 2D x-ray projections at positions that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (e) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by calculation, in a calibration procedure, from said projection geometries in step (a).

22. A method as claimed in claim 12 comprising positioning said x-ray system in step (d) for obtaining said m 2D x-ray projections at positions

that are respectively different from positions of said x-ray system in step (a) for acquiring said series of n 2D x-ray projections, and wherein step (e) comprises obtaining said projection geometries respectively associated with said m 2D x-ray projections by interpolation, from said projection geometries in step (a).